

[002] This application is a national stage completion of PCT/EP2003/007243 ◆◆
filed July 7, 2003 which claims priority from German Application Serial ◆◆
No. 102 31 346.6 filed July 11, 2002. ◆◆

[003] FIELD OF THE INVENTION ◆◆

[004] The present invention relates to a multi-step transmission in planetary style, in particular an automatic transmission for a motor vehicle in accordance with the preamble of patent claim 1. ◆◆

[005] BACKGROUND OF THE INVENTION ◆◆

[013] —— This object is attained in accordance with the invention by means of the features of patent claim 1. Further advantages and advantageous embodiments can be inferred from the dependent claims. ◆◆

[014] SUMMARY OF THE INVENTION ◆◆

[024] BRIEF DESCRIPTION OF THE DRAWINGS ◆◆

[025] The invention will now be described in more detail in the following, by way of example, with reference to the accompanying drawings, wherein in which: ◆◆

[029] DETAILED DESCRIPTION OF THE INVENTION ◆◆

[038] The brake 03 is permanently activated for the first four gears; in addition, the brake 04 and the clutch 67 are engaged for the first gear; the brake 05 and the clutch 67 are engaged for the second gear; the clutches 56 and 67 are engaged for the third gear and the clutches 14 and 67 are engaged for the fourth gear. The clutches 14, 56 and 67 are engaged for the fifth gear. The sixth gear results from engaging the brake 03 as well as the clutches 14 and 56 in accordance with Fig. 3; the seventh gear requires the clutch 14 as well as the brakes 03 and [[5]] 05. For the reverse gear the brakes 03 and 04 as well as the clutch 56 are engaged. ◆◆

1-22. (CANCELED)

23. (NEW) A multi-step transmission in planetary style, in particular an automatic transmission for a motor vehicle, comprising an input shaft (1) and an output shaft (2), which are arranged in a housing (G), first, second and third spider supported planetary gear sets (P1, P2, P3), at least seven rotatable shafts (1, 2, 3, 4, 5, 6, 7), as well as at least six switch elements (03, 04, 05, 14, 56, 67), brakes and clutches, whose selective meshing effects different gear ratios between the input shaft (1) and the output shaft (2), so that seven forward gears and one reverse gear can be realized, input occurs by means of the input shaft (1), which is in permanent connection with an element of the first planetary gear set (P1); output occurs via the output shaft (2), which is permanent connection with a planet carrier of the second planetary gear set (P2) and a planet carrier of the third planetary gear set (P3); a third shaft (3) is in permanent connection with a further element of the first planetary gear set (P1); a fourth shaft (4) is in permanent connection with a ring gear of the second planetary gear set (P2) and a ring gear of the third planetary gear set (P3); a fifth shaft (5) is in permanent connection with a sun gear of the third planetary gear set (P3); a sixth shaft (6) is in permanent connection with a ring gear of the first planetary gear set (P1); a seventh shaft (7) is connected to a sun gear of the second planetary gear set (P2); the third shaft (3) can be coupled to the housing (G) by means of a third brake (05); the fourth shaft (4) can be coupled to the housing (G) by means of a second brake (04); the fifth shaft (5) can be coupled to the housing (G) by means the a third brake (05); a first clutch (14) detachably connects the input shaft (1) and the fourth shaft (4) to each other; a second clutch (56) detachably connects the fifth shaft (5) and the sixth shaft (6) to each other; and a third clutch (67) detachably connects the sixth shaft (6) and the seventh shaft (7) to each other.

24. (NEW) The multi-step transmission of claim 23, wherein the input shaft (1) is in permanent connection with the planet carrier of the first planetary gear set (P1), and the third shaft (3) is in permanent connection with a sun gear of the first planetary gear set (P1).

25. (NEW) The multi-step transmission of claim 23, wherein the input shaft (1) is in permanent connection with a sun gear of the first planetary gear set (P1), and the

third shaft (3) is in permanent connection with a planet carrier of the first planetary gear set (P1).

26. (NEW) The multi-step transmission of one of the claim 23, wherein the first planetary gear set (P1) and the third planetary gear set (P3) are configured as a plus planetary gear set, and the second planetary gear set (P2) is configured as a minus planetary gear set.

27. (NEW) The multi-step transmission of claim 26, wherein the second planetary gear set (P2) and the third planetary gear set (P3) are combined as a Ravigneaux planetary gear set with a common planet carrier and a common ring gear.

28. (NEW) The multi-step transmission of claim 23, wherein additional free wheels can be used in every suitable location.

29. (NEW) The multi-step transmission of claim 28, wherein the free wheels are provided between at least seven rotatable shafts (1, 2, 3, 4, 5, 6, 7) and the housing (G).

30. (NEW) The multi-step transmission of claim 23, wherein the input and output are provided on a same side of the housing.

31. (NEW) The multi-step transmission of claim 23, wherein one or more of an axle differential and inter-axle differential is arranged on one of the input side or the output side.

32. (NEW) The multi-step transmission of claim 23, wherein the input shaft (1) can be separated from a driving motor by means of a coupling element.

33. (NEW) The multi-step transmission of claim 32, wherein the coupling element is one of a hydrodynamic converter, a hydraulic clutch, a dry starting clutch, a wet starting clutch, a magnetic power clutch, or a centrifugal clutch.

34. (NEW) The multi-step transmission of claim 23, wherein an external starting element is arranged behind the transmission in a direction of power flow, while the input shaft (1) is fixedly connected to a crankshaft of the engine.

35. (NEW) The multi-step transmission of claim 23, wherein starting occurs by means of a switch element of the transmission, while the input shaft (1) is in permanent connection with a crankshaft of the engine.

36. (NEW) The multi-step transmission of claim 35, wherein one of a first brake (03) or the brake (04) can be used as switch element.

37. (NEW) The multi-step transmission of claim 23, wherein a torsional vibration damper can be arranged between an engine and the transmission.

38. (NEW) The multi-step transmission of claim 23, wherein a wear-free brake can be arranged on each shaft.

39. (NEW) The multi-step transmission of claim 23, wherein an auxiliary drive can be arranged on each shaft in order to drive additional units.

40. (NEW) The multi-step transmission of claim 39, wherein an auxiliary drive can be arranged on one of the input shaft (1) or on the output shaft (2).

41. (NEW) The multi-step transmission of claim 23, wherein the switch elements are configured as one of power-shift clutches or brakes.

42. (NEW) The multi-step transmission of claim 41, wherein the switch elements are one or more of multi-plate clutches, band brakes, and cone clutches.

43. (NEW) The multi-step transmission of claim 23, wherein the switch elements are one or more of positive locking brakes and clutches.

44. (NEW) The multi-step transmission of claim 23, wherein an electric machine can be accommodated on each shaft as one or more of a generator and as a auxiliary driving machine.